

Fluorescent timer: the E5 mutant of the red coral protein drFP583 changes its fluorescence from green to red over time

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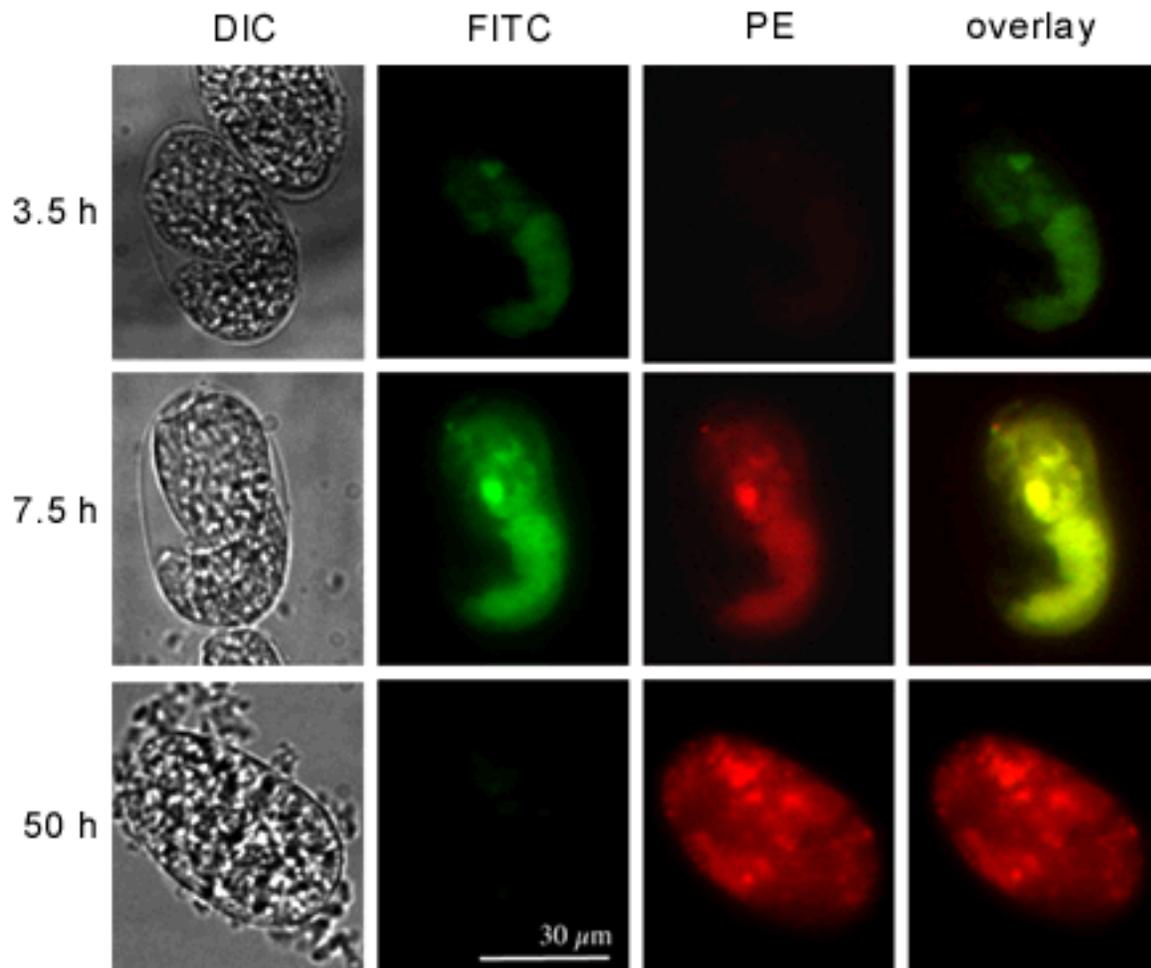
There are many ways to monitor the onset of gene expression, but so far it has been impossible to detect its down-regulation. This problem might have been solved now, as Terskikh and colleagues report in *Science* a simple method to follow promoter activity.

Last year, a red fluorescent protein (drFP583) was identified in tropical corals, further increasing the wide spectrum of possibilities to light up cells in different colors. Not satisfied with just one color, Terskikh and colleagues introduced random mutations into drFP583, and found one mutant (called E5) that changes its fluorescence from green to red in a time-dependent manner. As E5 switches from green to red fluorescence over time, it can be used as a timer for gene expression. During the first hours of activity of a promoter, green fluorescence is predominant, whereas sustained activity of the promoter leads to a mixture of green and red fluorescence. A few hours after the promoter is turned off, only red fluorescence remains.

Terskikh and colleagues verified these predictions in three experimental systems. First they monitored up- and down-regulation of E5 expression in Tet-on and Tet-off mammalian expression systems. Then they followed the activity of a heat-shock promoter during heat-induced stress of *Caenorhabditis elegans*. Last, they traced the expression of a homeobox gene involved in the patterning of anterior structures in *Xenopus laevis*. In all cases, green fluorescence correctly indicated the onset of gene expression and was replaced with red fluorescence when expression ceased.

So after decades of blue-stained embryos, we'll now have to get used to seeing gene expression in green and red.

Story contributed by Raluca Gagescu, [Nature Reviews Molecular Cell Biology](http://www.nature.com/nrm/) [http://www.nature.com/nrm/]



The change in fluorescence of E5 over time in *C. elegans*. The *E5* mutant was placed under the control of a heat shock promoter and injected into *C. elegans* embryos. Green fluorescence was detected 2 hours into the recovery phase following a standard heat shock treatment (1 hour incubation at 33°C). The embryos were documented under bright field (DIC), with a FITC filter, with a PE filter, and with an overlay at 3.5, 7.5, and 50 hours following heat shock. Yellow fluorescence, as seen in the overlay column at 7.5 hours, indicates a combination of green and red fluorescence.

Important Links

Live PubMed searches

- (1) Coral proteins
- (2) Heat-shock promoters
- (3) REVIEWS

Additional NCBI resources

NCBI Structure Group

Taxonomic tree of jelly fish & red coral [<http://www.ncbi.nlm.nih.gov/Taxonomy/CommonTree/wwwcmt.cgi?id=86600&id=6100>]

Box: VAST search for structures similar to E5

Click on the link below to start an html tutorial.

Search for structures similar to E5 [http://www.ncbi.nlm.nih.gov/Coffeebreak/CB18_Timer/vast1.html]